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SUSTAINED BLOOD PRESSURE RESPONDING DURING SYNTHETIC WORK.(U)
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

In Experiment I, hour-long elevations in mean blood pressure were elicited by the performance of a synthetic work task for both naive subjects and experienced subjects. Task-elicited changes in heart rate failed to reach significance although split-half reliabilities of both heart rate and mean blood pressure were high during task performance. Significant correlations were observed between performance effectiveness and cardiovascular response magnitude that differed in sign between experienced and naive groups. These

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20. Abstract, continued

data indicate the utility of the synthetic task for the study of sustained blood-pressure elevations elicited by work performance.

In Experiment II, task-elicited blood pressure, heart rate, and respiration rate were reliably and persistently elicited during five five-minute trials for two consecutive daily sessions. Blood pressure response magnitude declined slightly over trials for both sessions, and this diminution in magnitude was attributable to a gradual rise in baseline levels. Examination of trial-by-trial data and the between-session correlations for baseline and response magnitude values suggests that task-elicited blood pressure and heart rate responses, and to a lesser extent respiration rate responses, constitute a highly stable system which changes slowly, if at all, with practice.

EXPERIMENT I

Psychophysiological studies of elicited blood pressure responses in human subjects have often relied on the intermittent application of strongly aversive stimuli to elicit such responses. These stimuli have included electric shock, cold pressure stimulation, harrassment by the experimenter, and the performance of difficult psychomotor tasks (e.g., Gentry, 1970; De Leon, 1972; Obrist, 1963; Schachter, 1957). Because of the noxious and sometimes painful effects of most of these stimuli, experiments have often been limited to the use of short-duration stimuli and, consequently, to the observation of short-duration responses. Clearly, however, studies of long-duration elicited blood pressure responses have great potential value, both because of their clinical relevance and because of the need to average multiple auscultatory measurements in order to obtain reliable blood pressure data. Of the previously studied stimuli, psychomotor tasks seem the most suitable in situations where sustained stimulation is desired, since they need not be physically painful to the subject, and their parameters can be placed under strict experimental control.

Psychomotor tasks which simulate work are especially relevant as long-duration stimuli to investigate relationships between common environmental factors and blood pressure. One such task is the Multiple Task Performance Battery (MTPB) (Emurian, 1978), a version of the synthetic work task presented in Morgan and Alluisi (1972). Several studies have indicated that subjects will perform this task for periods of four or more hours a day over sessions of many days in duration (Emurian and Brady,

1979; Alluisi and Chiles, 1967). In addition, since the MTPB includes both computational and watchkeeping subtasks, blood pressure responses elicited by variants of the MTPB may be useful in the exploration of theoretical formulations of the relationship between various types of stimuli or tasks and cardiovascular response (e.g., Lacey and Lacey, 1970; Obrist, 1976).

The purpose of the present study, then, was to evaluate the usefulness of the MTPB for the elicitation of long-duration blood pressure responses and to investigate the reliability of blood pressures measured during long-duration (i.e., 1-hour) task performance. Additionally, analyses of covariation between measures of cardiovascular responding and task performance were undertaken.

METHOD

Subjects. Twenty paid volunteers were used as subjects. Twelve subjects were naive and had no prior experience with the experimental situation, and eight subjects had previously participated in ten-day residential experiments in the laboratory and had up to 80 hours' experience with the performance battery. Eighteen subjects were male, and two subjects were female. The two female subjects were members of the naive group. The naive subjects, with one exception (a new employee), were recruited via newspaper advertising. The experienced subjects were contacted via telephone and asked to participate in the present experiment. There was no selection criterion for the experienced subjects other than participation in ten-day residential experiments during which task performance was required.

Apparatus. The Multiple Task Performance Battery (MTPB) is a minicomputer-controlled battery of tasks which can be presented individually or in any combination on a single peripheral device, a VT100 cathode ray tube (CRT), and which uses the accompanying keyboard as a response manipulandum. A DEC PDP-8E serves as the system's central processing unit. The five subtasks comprising the MTPB are a probability monitoring task, an arithmetic operations task, a target identification task, a warning light monitoring task, and a blinking light monitoring task. Accurate operation of the subtasks produces "performance points" which are displayed cumulatively on the CRT screen. Further description of the MTPB can be found in Emurian (1978).

Mean arterial blood pressure and heart rate were intermittently monitored with a DINAMAP automatic blood pressure monitor which inflated automatically every five minutes and displayed mean arterial blood pressure, heart rate, systolic blood pressure and diastolic blood pressure to the experimenter via a digital display. The DINAMAP device detects the point of maximum oscillation in cuff pressure during cuff deflation. The cuff pressure at which the maximum oscillation occurs is highly related to mean arterial pressure (Geddes, 1970). Systolic and diastolic blood pressures are also computed by extrapolating from the rate of change in oscillation magnitude, but since mean blood pressure is detected more "directly," and in the interest of simplicity, only mean blood pressure data will be presented in the following results.

Procedure. Data were collected in a quiet experimental room. Naive subjects were trained to perform the MTPB at the beginning of the experimental session in the following fashion. The entire battery of five subtasks was presented to the subject, but instruction and familiarization was given for each subtask separately. When the subject indicated that he or she understood the nature of a given subtask, by making several correct responses, familiarization on the next subtask began. After familiarization with all five subtasks, naive subjects were given a rest period of approximately thirty minutes. Experienced subjects were simply presented with the display for the entire battery of subtasks, each subtask was quickly described, and any questions with respect to the subtasks were answered. The experienced subjects were then given a brief rest. After the rest period, each naive or experienced subject was reseated in front of the CRT, a blood pressure cuff was placed on the left arm, and the left arm was positioned on a cushioned platform with the cuff at approximately heart level. Each subject was then informed that the experiment would consist of ten minutes of rest, sixty minutes of task performance and another ten minutes of rest. The subject was instructed to do as well as possible on the task and to avoid changes in posture and movement of the left arm. Following the instructions, a ten-minute baseline period was initiated, followed by sixty minutes of task performance and then by another ten minutes of baseline. Blood pressure was sampled at five-minute intervals throughout the eighty-minute session.

The data were analyzed with a modification of a mixed design with one group factor and a repeated measures factor of baseline versus stimulation

or of baseline versus post-stimulation. The modification consisted of first differencing the data with respect to the repeated measures factor, *i.e.*, baseline minus stimulation, and then performing a test of significance for the overall mean, which is a test of the significance of the repeated measures factor. Finally, a test of the difference between the two group means was conducted to test the significance of the groups by repeated measure interaction. Since the group sizes were different, the unweighted means approximation was used.

RESULTS

Average baseline mean blood pressure and heart rate were lower for experienced subjects than for naive subjects. The average mean blood pressure and average heart rate were 89.75 mm/Hg and 72.33 Bpm for the naive group and 86.19 mm/Hg and 65.69 Bpm for the experienced groups. However, the difference between groups in both average mean blood pressure ($t=.76$, $df=18$) and the difference between groups in average heart rate ($t=1.24$, $df=18$) failed to reach significance.

Figure 1 presents the average change in mean arterial blood pressure in blocks of ten minutes for both naive and experienced subjects. This figure shows that mean blood pressure rose abruptly at task onset and remained elevated for the duration of the sixty-minute performance period. An analysis of variance of blood pressure change during the first ten minutes of task performance revealed a significant overall effect of task (baseline versus task performance) ($F=14.79$, $df=1,18$), but the task by groups interaction was not significant ($F < 1$). Similarly, an analysis of

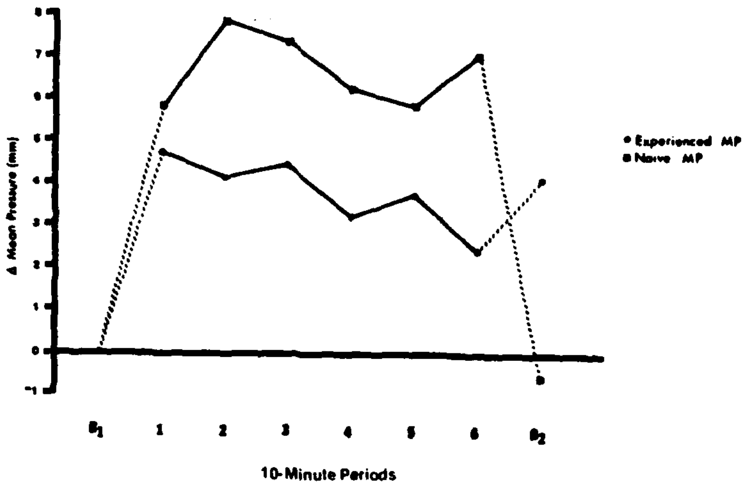

Figure 1. Task elicited change in mean blood pressure for six consecutive 10-min periods for both naive and e:perienced subjects.

variance of blood pressure change during the entire sixty minutes of task performance revealed a significant overall effect of task ($F=28.57$, $df=1,18$), but the task by groups interaction again was not significant ($F < 1$).

Figure 1 also shows that the mean blood pressure decreased to baseline values after task offset for naive subjects and remained elevated for experienced subjects. An analysis of variance revealed that the overall difference between the baseline period preceding task onset and the baseline period following task offset was not significant ($F=1.4$, $df=1,18$), but the groups-by-baseline interaction was significant ($F=4.50$, $df=1,18$).

Figure 2 presents the average change in heart rate in blocks of ten minutes for both experienced and naive subjects. This figure shows that heart rate increased about 4 beats per minute during the first ten minutes of task performance for naive subjects and increased about 1 beat per minute during the first ten minutes of task performance for experienced subjects. After the initial task-elicited increase, the average heart rate for naive subjects remained elevated for sixty minutes until task offset. In contrast, the slight task-elicited heart rate increase seen for experienced subjects was followed by a slow decline that persisted for the remainder of the session. An analysis of variance of heart rate change during the first ten minutes of task performance revealed that the effect of task narrowly failed to reach significance ($F=3.97$, $df=1,18$) and that the task by groups interaction was not significant ($F < 1$). Similarly, an analysis of variance of heart rate change for the entire sixty-minute

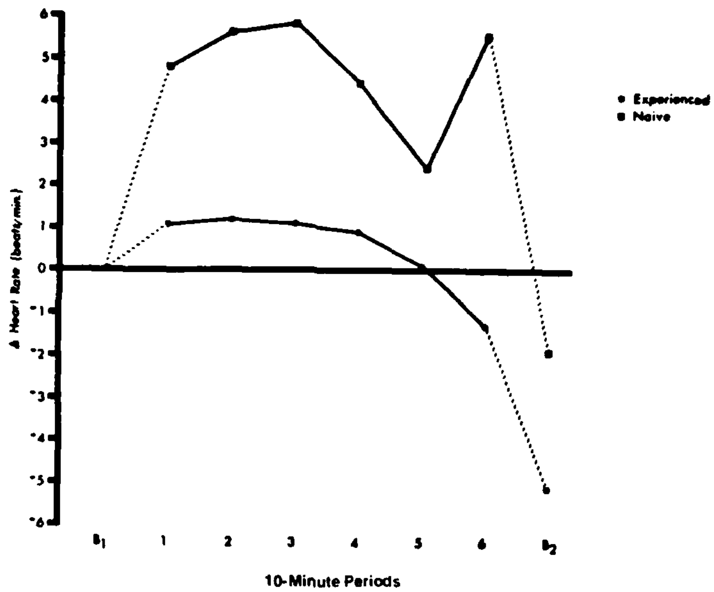

Figure 2. Task elicited change in heart rate for six consecutive 10-min periods for both naive and experienced subjects.

period of task performance revealed no significant effect of either task ($F=2.43$, $df=1,18$) or of the task by groups interaction ($F < 1$). Inspection of Figure 2 also shows that post-task baseline values were slightly less than the pre-task baseline values for both naive and experienced subjects. An analysis of variance revealed that the overall difference between the baseline period preceding task onset and the baseline period following task offset was significant ($F=11.55$, $df=1,18$) and that the groups-by-baseline interaction was not significant ($F=1.34$, $df=1,18$).

The reliability of the blood pressure and heart rate measurements during task performance was evaluated by correlating the means for odd and even determinations. The odd-even correlations for blood pressure and heart rate in the naive group were .96 and .95, and the odd-even correlations for blood pressure and heart rate in the experienced group were .93 and .96. This indicates that multiple blood pressure determinations allow highly reliable measurement of blood pressure even in situations where the subject is repeatedly stimulated by a variety of subtasks occurring irregularly in time.

Figures 3a and 3b show scatterplots of performance points and overall mean blood pressure and heart rate response magnitudes for naive subjects. Inspection of these figures indicates that a positive relationship exists between the magnitude of blood pressure response and performance ($r=.75$) and between heart rate response magnitude and performance ($r=.42$). Figures 4a and 4b show scatterplots of performance scores and overall mean blood pressure and heart rate response magnitudes for experienced subjects.

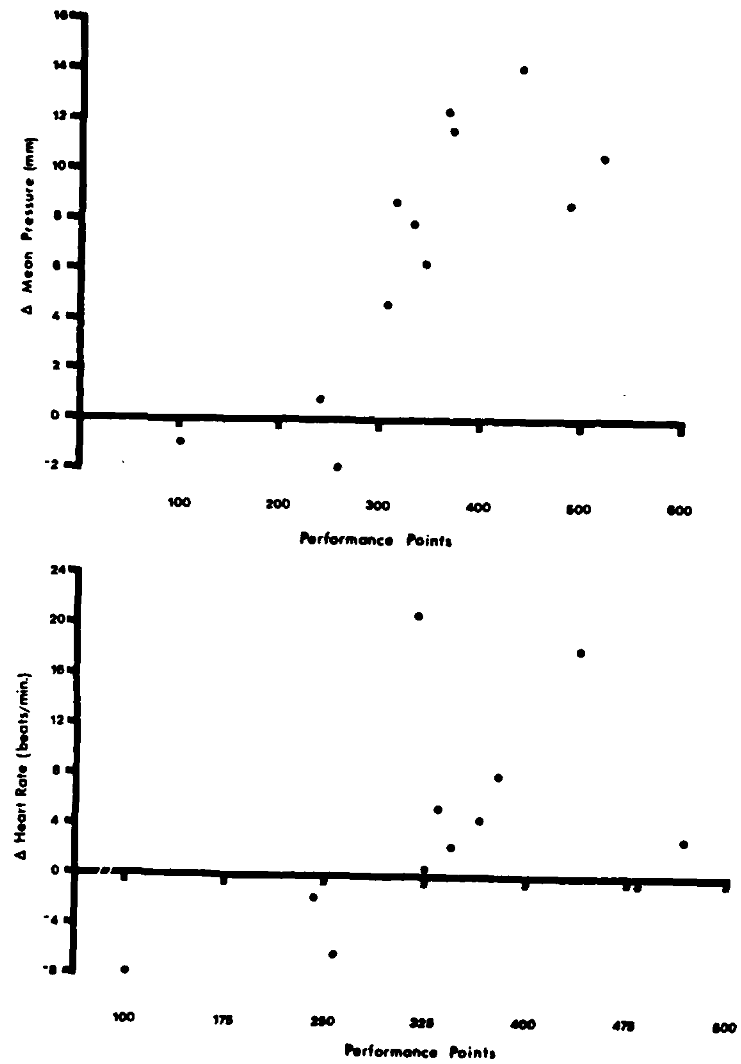

Figure 3. Scatter plots showing relationship between performance points and 60-min task elicited change in mean blood pressure and heart rate for naive subjects.

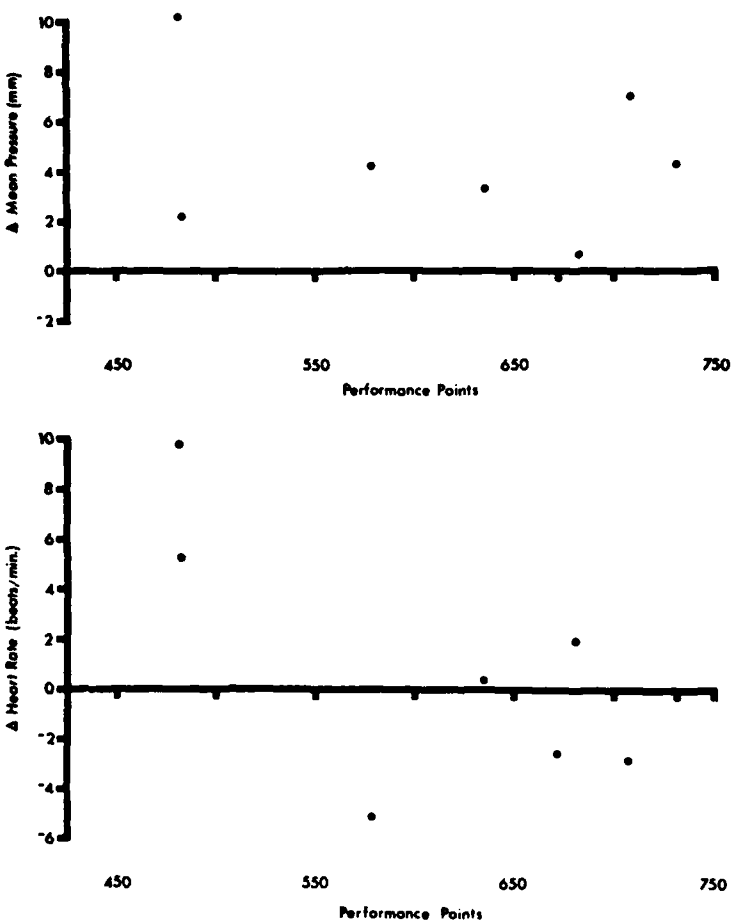

Figure 4. Scatter plots showing relationship between performance points and 60-min task elicited change in mean blood pressure and heart rate for experienced subjects.

Inspection of these figures indicates that a small negative relationship exists between mean blood pressure response magnitude and performance ($r=-.33$) and that a larger negative relationship exists between heart rate response magnitude and performance ($r=-.70$).

As might be expected, experienced subjects earned more performance points, which resulted from accurate operation of the several MTPB subtasks, than naive subjects. The average number of points earned was 622.4 for experienced subjects and 342.6 for naive subjects. A t-test revealed that these two means were significantly different ($t=5.67$, $df=1,18$).

DISCUSSION

Performance of synthetic work was associated with sustained and reliable hour-long elevations in mean blood pressure in both naive subjects and highly experienced subjects. This finding indicates that the MTPB is valuable both as a stimulus for the elicitation of long-term blood pressure elevations within a session and as a stimulus for repeated blood pressure elevations for many sessions. Informal questioning of subjects after termination of the session indicated that the subjects did not feel that the task was aversive, but indeed, described the task as "a TV game." This finding, of course, is only anecdotal, but if correct, it certainly extends the range of application of the task. It is not clear, however, if this statement referred to the superficial resemblance between the MTPB and TV games or if it referred to a genuine similarity between the MTPB and TV games in terms of their recreational properties and performance challenges.

For naive subjects, the positive correlations between (1) blood pressure response and performance and (2) heart rate response magnitude and performance may reflect the operation of a "motivational" variable. Although the role of motivational factors with respect to cardiovascular responding is not clearly understood (e.g., Elliot, 1974), highly competitive pairs of type-A subjects have been found to exhibit larger-magnitude digital vasomotor responses during the performance of a mixed-motive game than less competitive pairs of type-B subjects (Van Egeren, 1979).

The motivational interpretation is complicated by the fact that correlations between performance and heart rate and mean blood pressure response magnitude were reversed in sign (i.e., negative) in the experienced group. This effect may be attributable to a process where improvement on the task and rate of habituation of the tonic blood pressure response are themselves negatively related. This conjecture cannot be critically examined with the present data, however, since the naive and experienced subjects were members of two independent groups, and within-subjects trends in performance and cardiovascular response magnitude were not available. Finally, the motivational interpretation arises in an indirect fashion from small sample correlational data and, therefore, must await clarification through further experimental investigation.

The failure to find strong evidence for an effect of performance of the MTPB on heart rate was unexpected, and it was probably at least partially due to the intermittent sampling of heart rate. However, even

though mean blood pressure was sampled in a similar intermittent fashion, highly significant task-elicited increases in mean blood pressure were obtained. Examination of individual subject data revealed that almost 40% of all subjects decreased in heart rate during task performance, while only 16% of all subjects showed decreased blood pressure during task performance. This suggests that some subjects respond to MTPB performance with increases in both blood pressure and heart rate, while other subjects respond with increased blood pressure and decreased heart rate, a pattern which has been observed in dogs waiting to begin an avoidance session (Anderson and Brady, 1971).

In summary, the MTPB is a flexible tool for the elicitation of long-duration blood pressure change in a meaningful performance situation, *i.e.*, synthetic work. The presence or absence of the various subtasks as well as the rate of presentation of the subtasks are easily controlled by the experimenter. This flexibility allows the investigation of various task types and combinations on physiological response and effects of interactions between tasks on physiological response. Finally, the presence of significant correlations between performance and several cardiovascular measures indicates that performance-physiology relationships may also be explored with the MTPB.

EXPERIMENT II

Studies involving the elicitation of blood pressure responses have typically used the elicited response as a tool for the investigation of other variables such as response patterning (Engel and Bickford, 1961), vulnerability to cardiovascular disease (Krantz et al., 1981), or the study of theories of cardiovascular-somatic integration (Obrist, 1971). Because of such research emphases, only a few studies have directly addressed the short-term and long-term persistence of such responses.

In this latter regard, Experiment I indicated that task-elicited blood pressure elevations showed no diminution in magnitude during a 60-minute experimental session during which the task was continuously present. This effect was demonstrated with both naive subjects and highly-practiced subjects.

Malmo, Shagass, and Heslam (1951) found that task-elicited increases in systolic blood pressure declined sharply in magnitude after several trials. However, a different task was used on each trial, and the tasks were presented in a fixed sequence. This procedure inextricably confounds the effects of type of task with order, allowing the alternative explanation that the tasks presented late in the series were less "potent" than tasks presented early in the series.

In another series of experiments, Manuck and Schaefer (1978) and Manuck and Garland (1980) found that blood pressure responses elicited by

an anagram task showed a high test-retest reliability, even over an interval of 13 months. Examination of the figures presented in the Manuck and Schaefer (1978) and Manuck and Garland (1980) studies suggests that the magnitude of the elicited blood pressure response diminished slightly over sessions. This trend, however, was not interpreted by the authors.

Against this background, then, the purpose of the present study was to investigate the effect of repeated elicitation of the blood-pressure response, both within sessions and between sessions. In addition, the reliability of blood-pressure responding across sessions as well as the intercorrelation of blood-pressure response magnitude with other psychophysiological measures and with task performance were assessed.

METHOD

Subjects

Ten paid volunteers were used as subjects. Four of the subjects were female, and six of the subjects were male.

Apparatus

The apparatus was identical to that used in Experiment I.

Procedure

Upon entering the laboratory, each subject was informed that the purpose of the experiment was to investigate physiological responding during task performance. The subject was then seated in a comfortable chair in a sound-attenuated room and trained to perform the MTPB in the

following fashion. The entire battery of five subtasks was presented, but instruction and familiarization were given for each subtask separately. When the subject indicated that he or she understood the nature of a given subtask and had made several correct responses, familiarization on the next subtask began. After familiarization with all subtasks, the subjects were given a short rest. After the rest period, each subject was reseated in the sound-attenuated room, a blood pressure cuff was placed on the left arm, and the left arm was positioned at approximately heart level on a cushioned platform. A noseclip thermister for respiration monitoring was placed on the subject's nose, and EKG electrodes were placed on the subject's right calf, on the sternum, and on the right lateral chest wall. Each subject was then informed that the experiment would consist of approximately ten minutes of rest followed by five minutes of task performance, five minutes of rest, five minutes of task performance, etc., until five task and five rest segments were completed. The subjects were also informed that each point earned on the task was worth $.04 and that both changes in posture and movement of the left arm should be avoided. Each subject participated for two consecutive daily sessions at the same time of day. The second session was identical to the first session with the exception that training on the MTPB was given at the beginning of the first session only.

The blood pressure data were averaged into successive 5-min means for each subject. EKG and respiration were measured during 30-sec epochs prior to each blood pressure cuff inflation. The average inter-beat and inter-inspiration interval was obtained for each epoch, transformed to its reciprocal, and then averaged into successive 5-min means. Although the

Vitastat measured systolic, diastolic, and mean blood pressure, only mean blood pressure data will be presented. Also, the reciprocal transformed average inter-beat and inter-inspiration interval data will be referred to as heart rate and respiration rate, respectively, although it corresponds only approximately to a true rate measure. Unless otherwise noted, response magnitude was defined as the difference between each task level and the immediately preceding baseline level.

RESULTS

Figure 5 shows the mean blood pressure response (i.e., differences) for all ten subjects across successive trials on Days 1 and 2. Each trial consists of a comparison between a 5-min task interval and the immediately preceding 5-min rest interval. This figure shows that the mean blood pressure response declines in magnitude over trials for both days and that the overall response magnitude is higher on the first day. An analysis of variance revealed that the average mean blood pressure response magnitude was significantly greater than zero ($F=27.10$, $df=1,9$, $p<.01$) and that the difference in average mean blood pressure response magnitude for Days 1 and 2 failed to reach significance ($F=2.89$, $df=1,9$). The analysis also revealed that the overall linear trend in mean blood pressure response magnitude was significant ($F=5.23$, $df=1,9$, $p<.05$) and that the difference in linear trend between Days 1 and 2 was not significant ($F<1$).

Figure 6 shows mean blood pressure values across successive 5-min resting intervals for Days 1 and 2 for all ten subjects. This figure shows that mean blood pressure increased over trials and that the overall mean

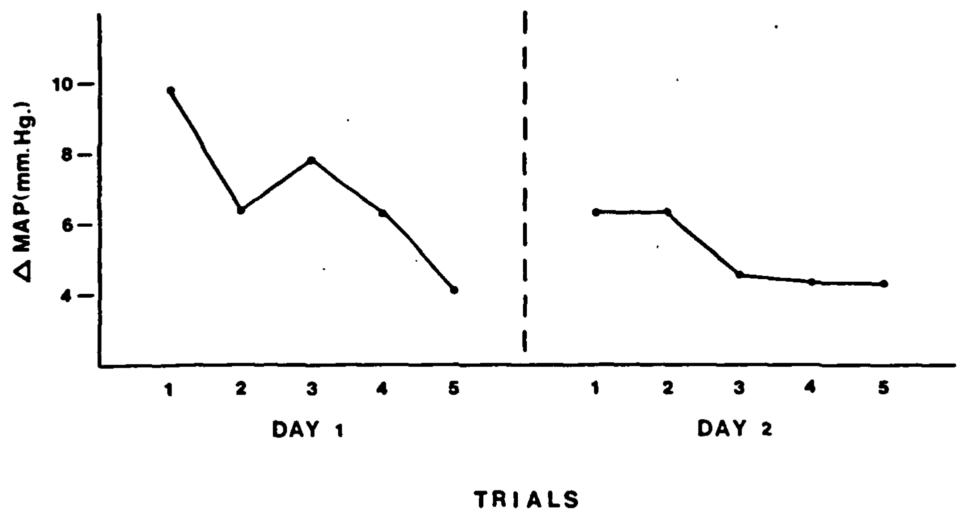

Figure 5. Average blood pressure response magnitude for five consecutive 5-min trials for each of two consecutive daily sessions.

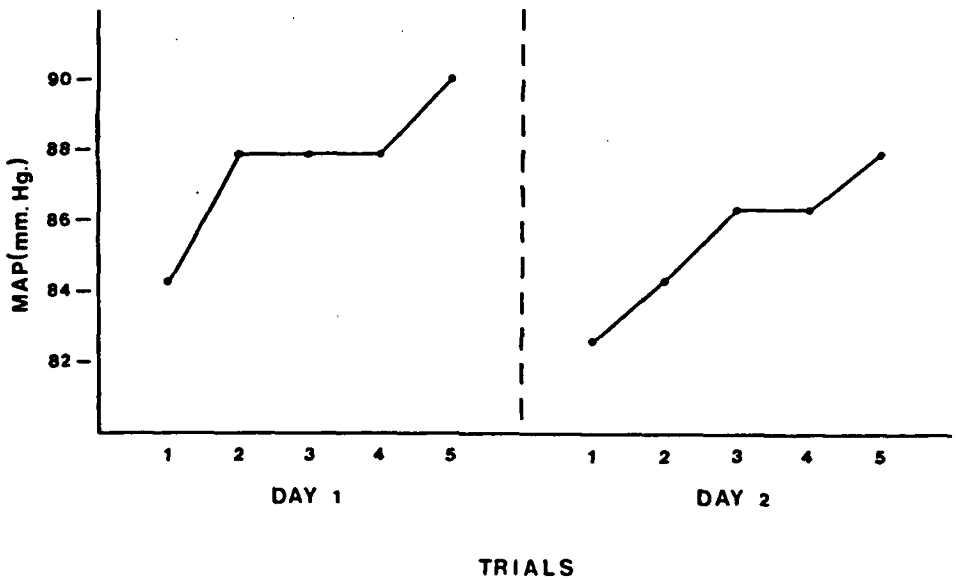

Figure 6. Average baseline blood pressure levels for five consecutive 5-min baseline periods for each of two consecutive daily sessions.

blood pressure was greater for Day 1 than for Day 2. An analysis of variance revealed that the difference in resting mean blood pressure level between Days 1 and 2 was not significant ($F<1$) but that the linear trend in resting mean blood pressure over trials was significant ($F=9.75$, $df=1,9$, $p<.01$). The difference in linear trend between Days 1 and 2 also was not significant ($F<1$).

Inspection of Figures 5 and 6 suggests that the decline in mean blood pressure response magnitude (i.e., differences) over trials is produced by a gradual increase in pressure during resting intervals. Accordingly, mean blood pressure response magnitude was redefined as the difference between the first resting value and each of the five successive task levels. An analysis of variance of the (redefined) mean blood pressure responses revealed that the average mean blood pressure response magnitude was significantly different from zero ($F=26.02$, $df=1,9$, $p<.01$) and that the difference between Days 1 and 2 in mean blood pressure response magnitude was not significant ($F=2.16$, $df=1,9$). Finally, neither the linear trend in mean blood pressure response magnitude over trials ($F=1.25$, $df=1,9$) nor the difference in linear trend between days ($F<1$) was significant.

Figures 7a and 7b show the average baseline (i.e., resting) and task levels for heart rate and for respiration rate. An analysis of variance of heart rate response magnitude showed that the average heart rate response was significantly different from zero ($F=17.62$, $df=1,9$, $p<.01$) and that the difference in response magnitude between Days 1 and 2 barely failed to reach significance ($F=4.15$, $df=1,9$, $p<.1$). The linear trend in heart rate

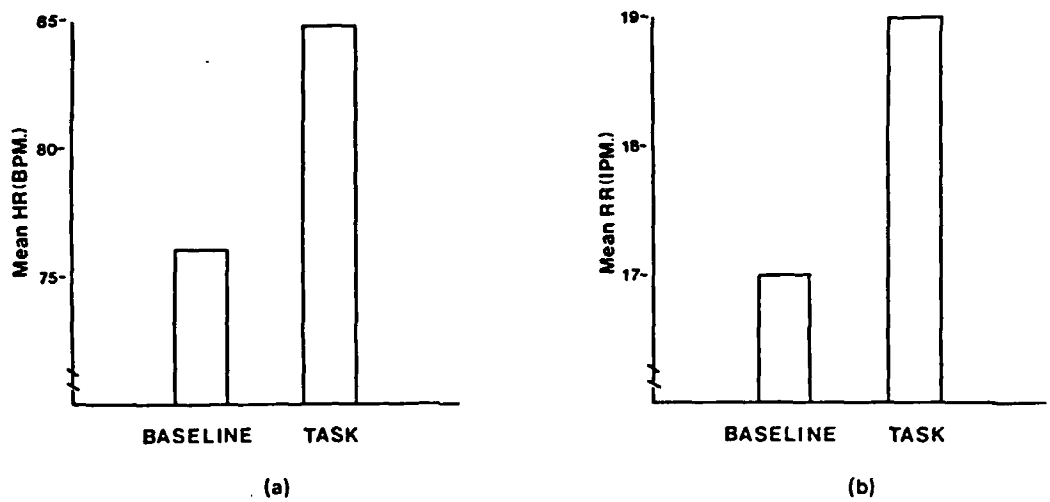

Figure 7. Average baseline level and average task level for heart rate (a) and for respiration rate (b).

response magnitude ($F=1.04$, $df=1,9$) and the difference in linear trend between Days 1 and 2 ($F<1$) also failed to reach significance. Similarly, an analysis of variance of respiration response magnitude revealed that the average respiration response was significantly different from zero ($F=23.09$, $df=1,7$, $p<.05$). No significant effects were found for the difference in respiration response magnitude between Days 1 and 2 ($F<1$), linear trend in response magnitude ($F<1$), and the difference in linear trend in response magnitude between Days 1 and 2 ($F=2.09$, $df=1,7$).

Table 1 shows the intercorrelation between several mean blood pressure, heart rate, and respiration measures for Days 1 and 2. The baseline measures are those obtained during the first 5-min resting period of the day, and the response measures are those obtained by subtracting each baseline level from the respective task level. Inspection of this table shows that the correlations between the baseline values for blood pressure, heart rate, and respiration rate are near zero for both days. Substantial positive correlation exists between blood pressure response magnitude and heart rate response magnitude for both days, and substantial negative correlation exists between baseline levels and response magnitude for blood pressure and for respiration rate for both days. In addition, the negative correlation between baseline blood pressure and heart rate response magnitude becomes greater in magnitude and reaches significance on the second day. Other evidence of dynamic changes in the pattern of inter-relationships over days can be found in the table, but the sample size precludes the use of more sophisticated techniques for the investigation of such changes.

Table I. Product-moment correlations between blood pressure (BP), heart rate (HR), and respiration rate (RR) values for average baseline levels (b) and average response magnitude (r) for each daily session.

Table I

	Day 1					Day 2				
	BPr	HRb	HRr	RRb	RRr	BPr	HRb	HRr	RRb	RRr
BPb	-.694	.056	-.442	.117	-.198	-.634	.289	-.725	-.056	-.163
BPr		-.017	.794	-.581	.370		-.590	.777	.508	-.617
HRb			-.122	.342	.157			-.527	-.551	.566
HRr				-.136	-.141				.490	-.275
RRb					-.767					-.702

Intercorrelations or test-retest correlations were also computed between Days 1 and 2 for baseline levels and for the response magnitude values. The correlations between Days 1 and 2 values for blood pressure baseline levels, heart rate baseline levels, and respiration rate baseline levels were .683, .897, and -.382, respectively. The correlations between Days 1 and 2 values for blood pressure response magnitude, heart rate response magnitude, and respiration rate response magnitude were .677, .761, and -.387.

Performance on the MTPB improved with practice. The mean number of performance points earned was 140.2 and 169.2 for Days 1 and 2. This difference was significant ($F=39.28$, $df=1,9$, $p<.01$). A significant effect was also found for the overall positive linear trend in performance ($F=20.07$, $df=1,9$, $p<.05$). However, the difference between Days 1 and 2 in linear trend ($F=1.21$, $df=1,9$) was not significant. Finally, no correlation between performance and the several cardiovascular and respiration measures was significant.

DISCUSSION

Repeated performance on a Multiple Task Performance Battery was associated with persistent and reliable increases in mean blood pressure as well as with increases in heart rate and respiration rate. Blood pressure response magnitude tended to decline over trials, but this trend was due to a gradual increase in baseline levels over trials. When blood pressure response magnitude was redefined as the change in blood pressure level from an initial baseline, no trial-by-trial diminution in blood pressure

response magnitude occurred. The correlations between the baseline values for Days 1 and 2 and for response magnitude values for Days 1 and 2 were positive in sign and statistically significant for both mean blood pressure and heart rate, indicating that task-elicited cardiovascular responding exhibits between-session stability as well as within-session stability. These findings, together with the Experiment I, Manuck and Schaefer (1979), and Manuck and Garland (1980) findings, suggest that the task elicited blood pressure response is characterized by stability and persistence with respect to time, making it an ideal tool for the study of individual differences in cardiovascular function as well as for the study of the effects of long-acting experimental variables on cardiovascular change.

Although it is not being maintained that task-elicited blood pressure elevations never habituate or decline with practice, it seems clear that under certain conditions reliable elevations in blood pressure can continue to be elicited by task performance even after extensive experience with the task. The fact that the task-elicited blood pressure response declines slowly, if at all, in magnitude with experience assumes special significance when it is considered that the task used in the present study, the MTPB, was designed as a synthetic work task, and it is capable of being performed for as many as eight hours a day for many consecutive days. Importantly, the task was not designed to be stressful, and subjects rarely describe the operation of the task in language reflecting the presence of subjective feelings of discomfort. The dimension of the task responsible for persistent blood pressure elevations is perhaps due to an effect such as active coping, as described by Obrist (1981), and not due to a stressful

or aversive component.

Despite the fact that Experiment I reported a significant, positive correlation with blood pressure response magnitude and performance on the MTPB, in Experiment II no significant correlations between response magnitude and performance were obtained. In Experiment I, money earned was not contingent on performance, whereas in Experiment II each performance point was associated with an increment of $.04. Money reinforcement may narrow the range of a motivational or individual difference variable responsible for the correlation between blood pressure response magnitude and performance, obscuring the relationship. A similar finding has been reported with respect to the relationship between the Type A-Type B dimension and blood pressure response magnitude. Manuck and Garland (1979) found that the correlation between scores on the Jenkins Activity Survey for Health Prediction (a self-report inventory for measurement of the Type A-Type B dimension) and systolic blood pressure response was significant only when no incentive was awarded for task performance. The role of such motivational factors as they interact with performance-physiology relationships must await clarification by further experimental analyses.

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